Status of AIRS at ECMWF

ECMWF AIRS team changes:

- Tony McNally
- Andrew Collard (new ex *UK*)
- Thomas Auligne (new ex *Meteo France*)
- Richard Engelen
- Marco Matricardi

- Phil Watts
- Jonathon Smith
- Frederic Chevallier

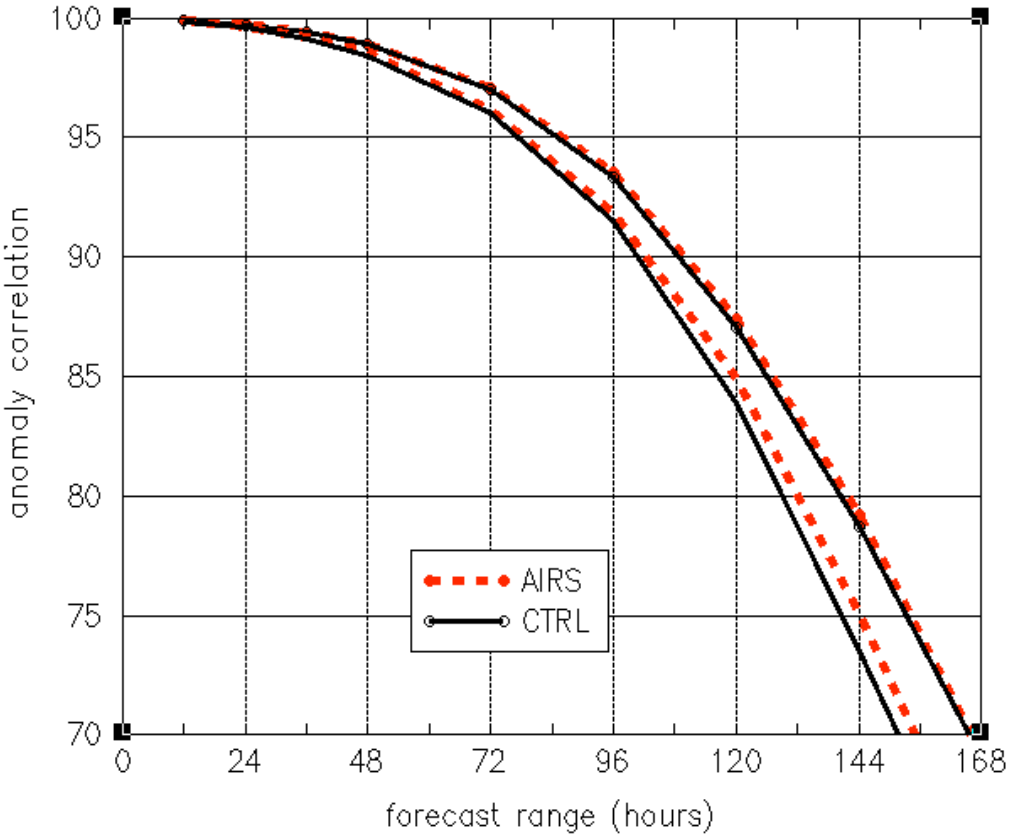
Status of AIRS NWP impact

•Day 1 scheme implemented in operations October 2003 (pre-operational trials suggested neutral to slightly positive impact over 100 cases)

Post-operational trial:

AIRS impact from 70 cases of 28R1 for 500hPa geopotential Northern Hemisphere (top two lines) and Southern Hemisphere (bottom two lines). Period tested: 20040301 to 20040509

(nb. NOAA-17 loss and new humidity analysis)



Development topics

- Complete diagnosis of single instrument experiments
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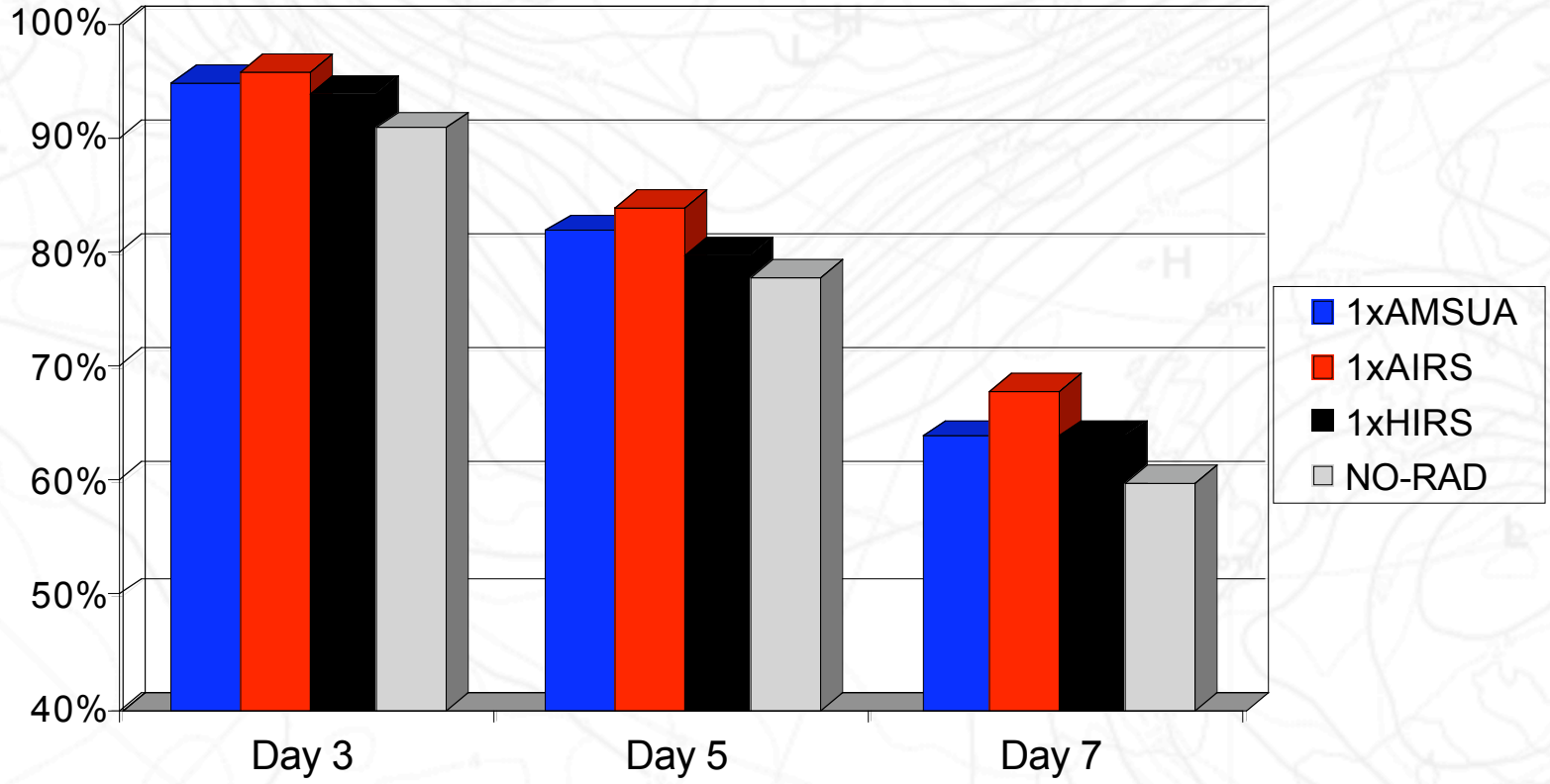
Understanding single instrument experiments (1)

Anomaly correlation of 500hPa height for the **Southern Hemisphere**
(average of 50 cases summer and winter 2003 verified with OPS analyses)

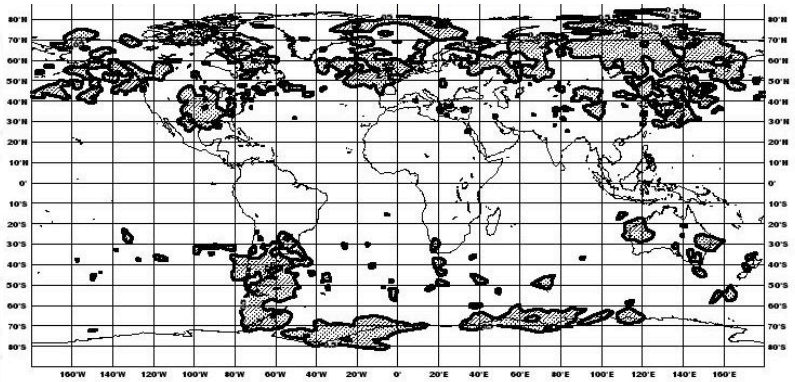


AIRS out performs any other single instrument forecast impact

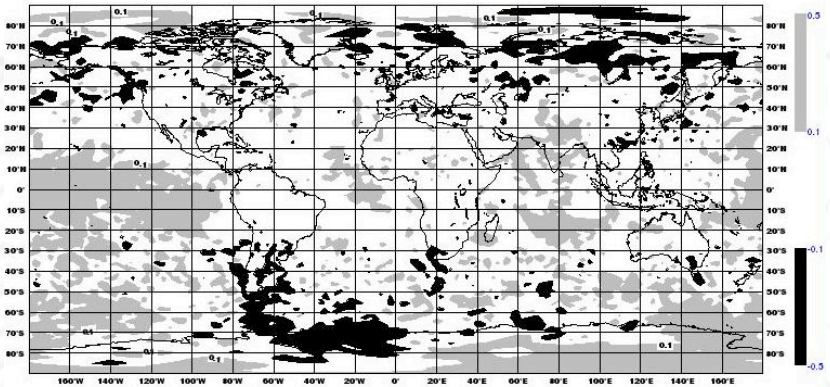
But why ? … analysis increments …

RMS temperature increments at model level 36 (approximately 400hPa) averaged over 26 days (June 2003)

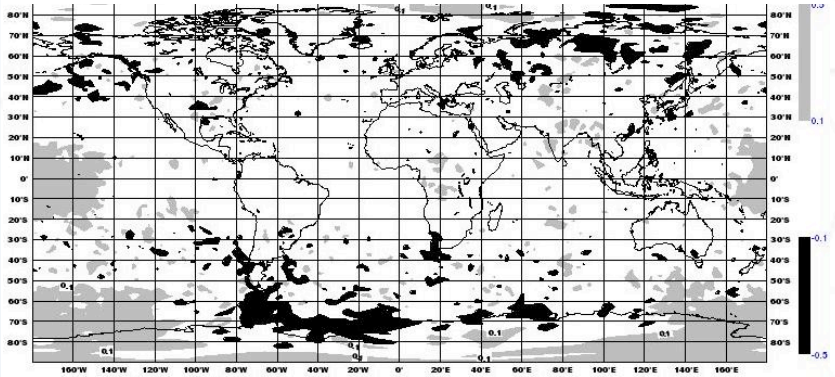
No radiance assimilation (NORAD) increments



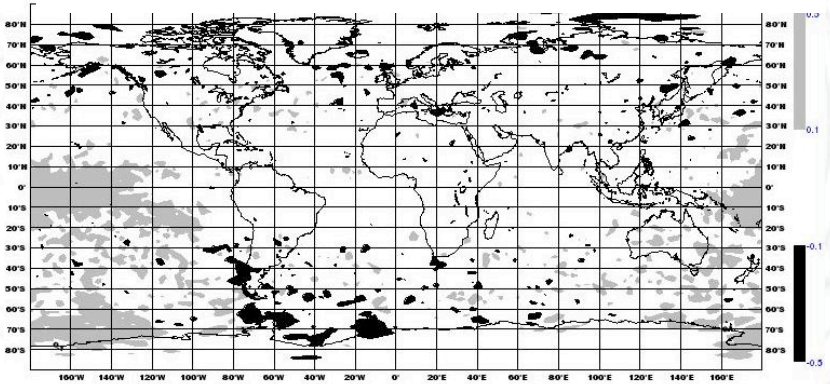
AIRS only assimilation **minus NORAD** increments



AMSUA only assimilation **minus NORAD** increments

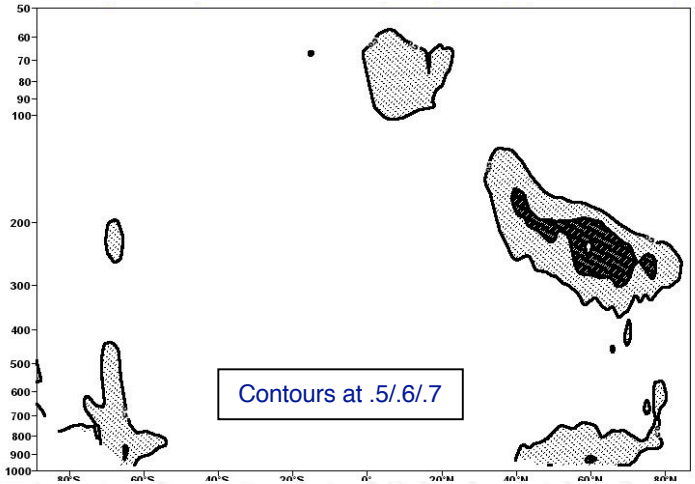


HIRS only assimilation **minus NORAD** increments

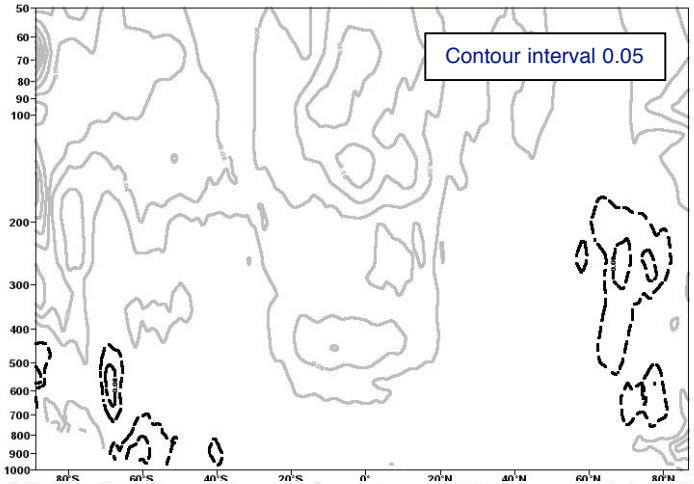


Vertical structure of analysis increments …

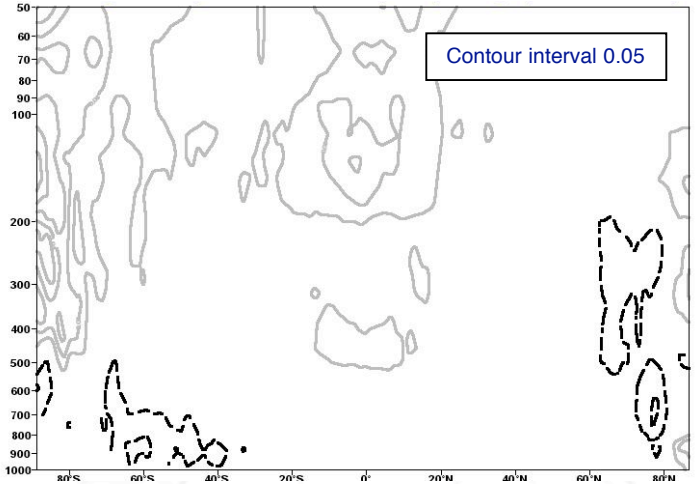
No radiance assimilation (NORAD) increments



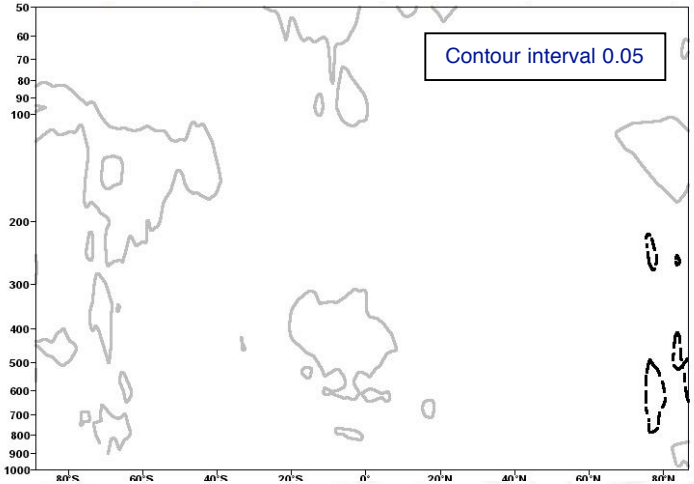
AIRS only assimilation **minus NORAD** increments



AMSUA only assimilation **minus NORAD** increments



HIRS only assimilation **minus NORAD** increments



The size and vertical structure of increments is higher with AIRS …

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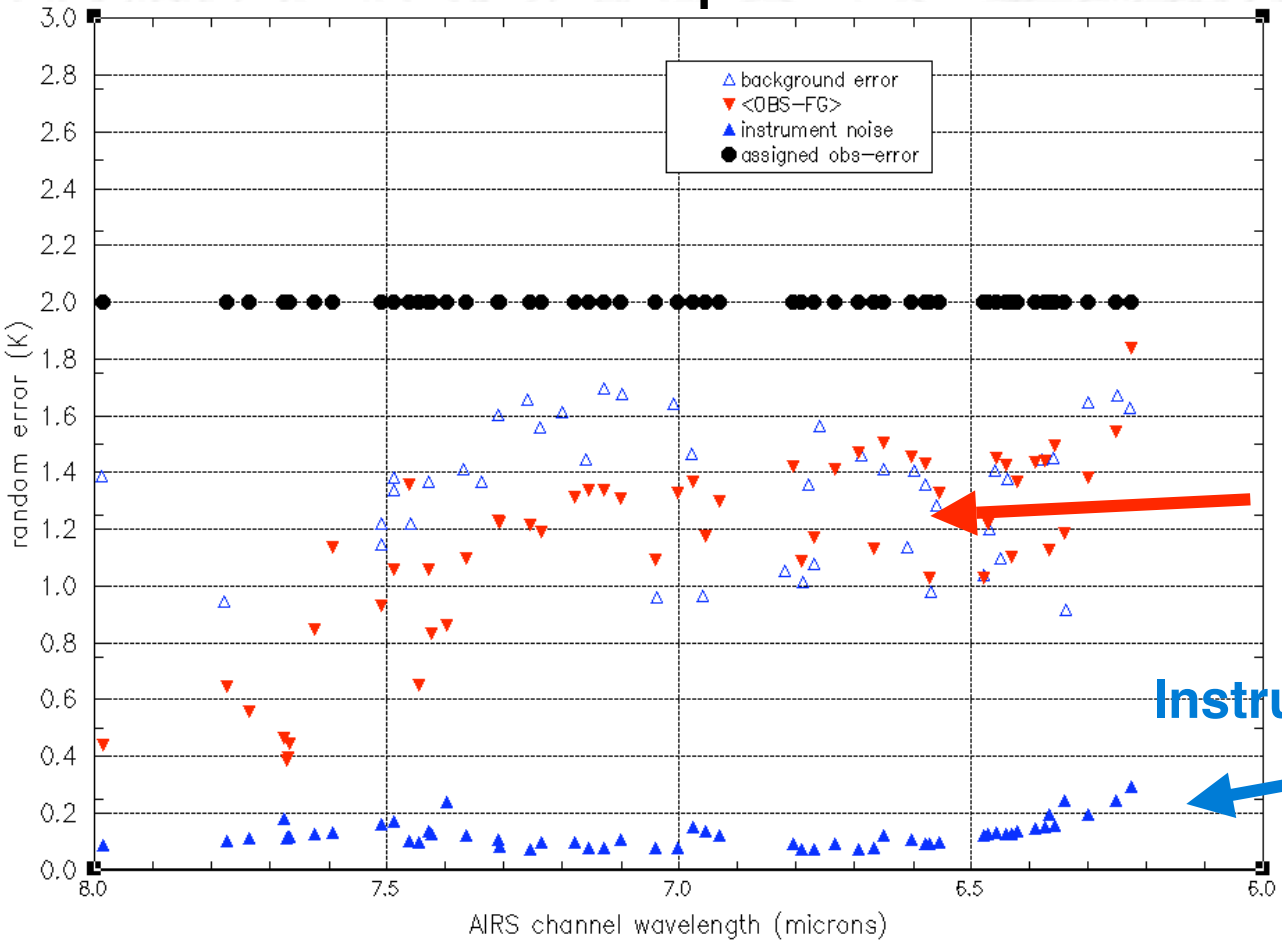
Motivation for Observation error Study

Observed minus calculated radiance statistics for AIRS water vapour band



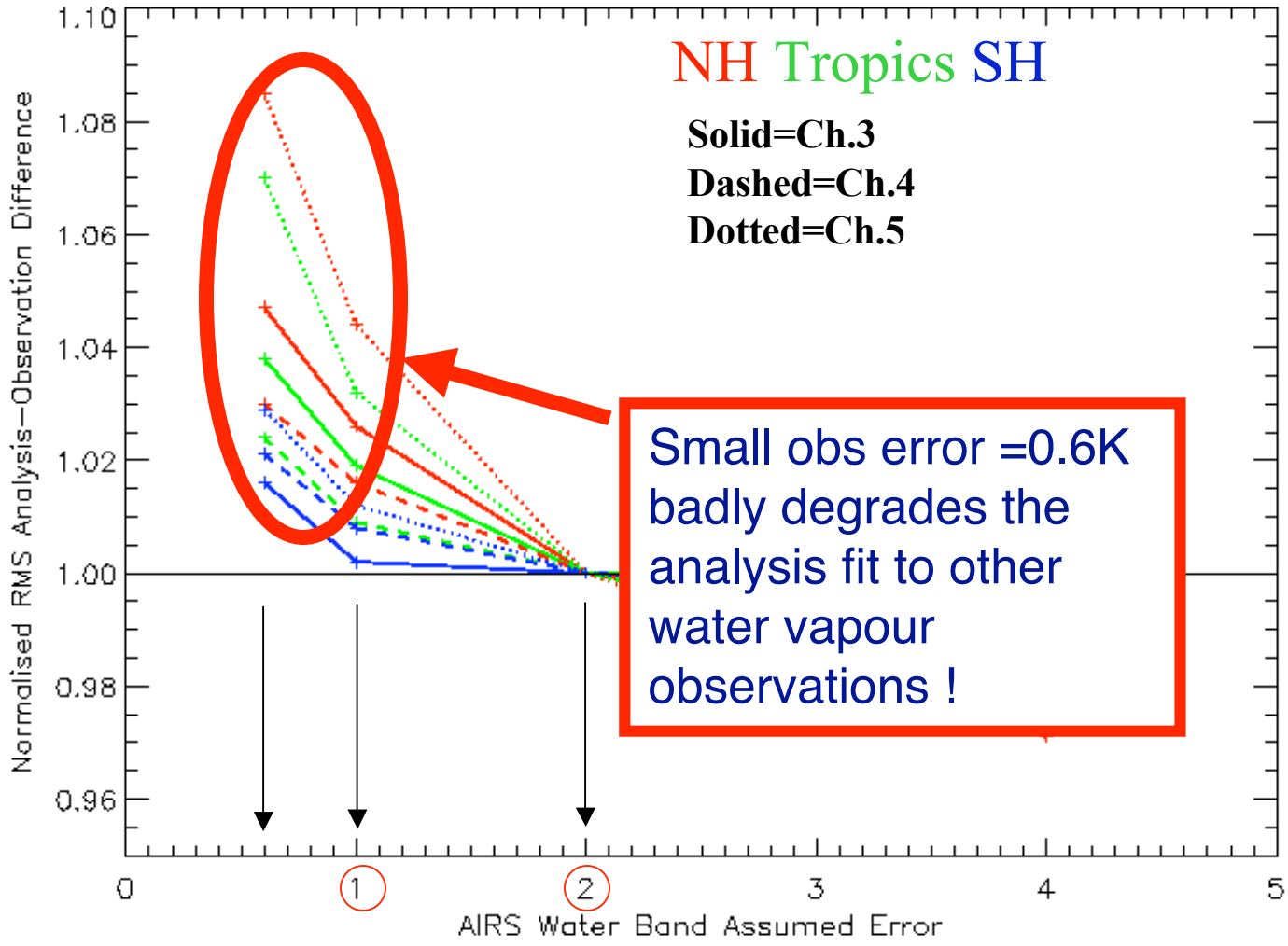
NWP error Dominates (O minus B)

Instrument error low

So should we set the observation error to low values ?

Experiments with different (diagonal) Observation Error

Analysis fit to NOAA-16 AMSU-B data



Estimating AIRS observation error

Contributing elements …

- Fast model error
- LBL error
- Instrument noise
- Non-linearity error
- Non-Representativeness error

But uncorrected biases and poorly modelled correlations may prevent the use of “correct” observation error

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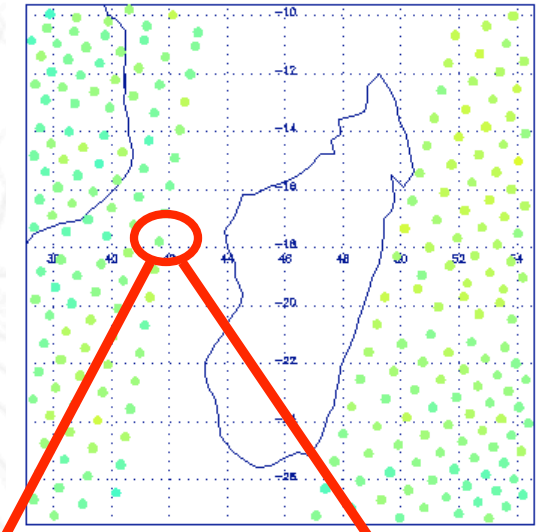
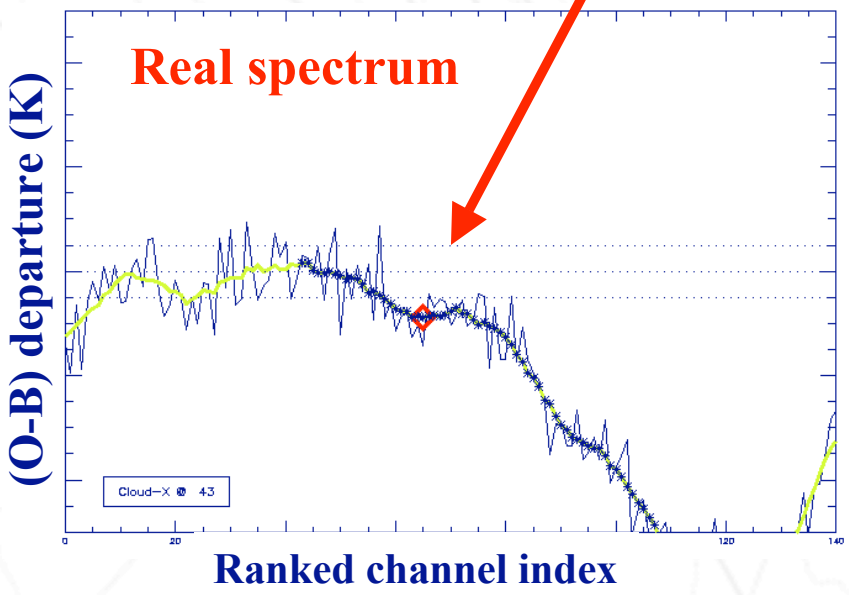
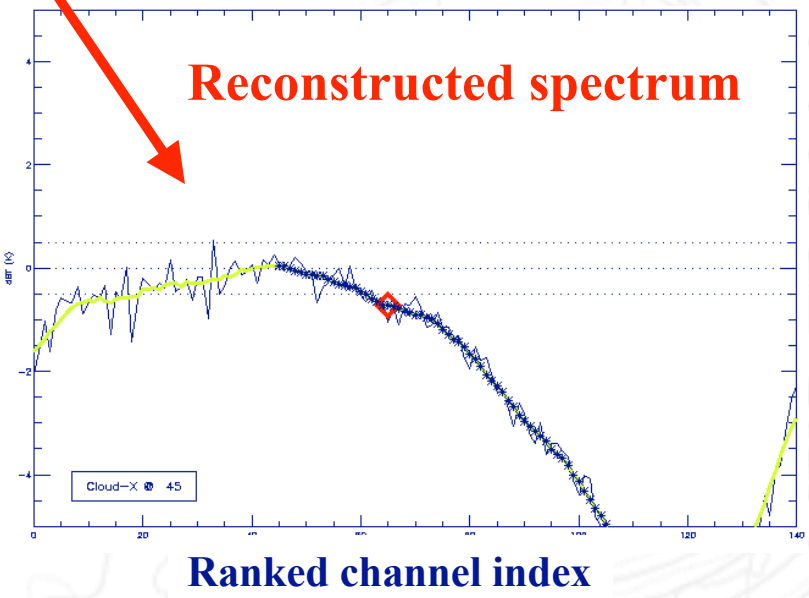
De-noising with 200 NESDIS principal components

The PC de-noising does not significantly influence the filtering used to reduce noise during the cloud detection process







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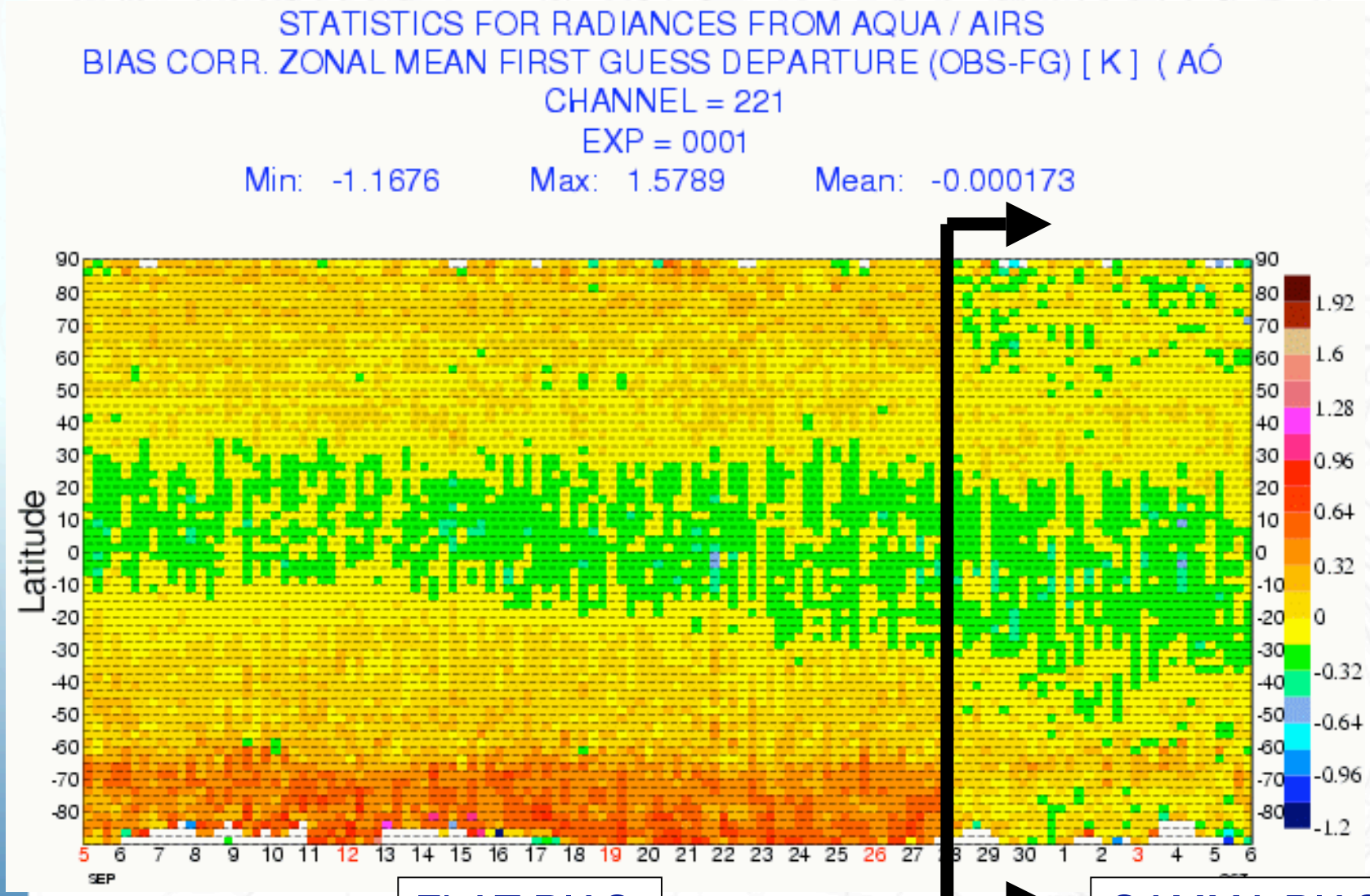
Use of the gamma bias correction for AIRS



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RTIASI version 5

New Features:

- Multiple scattering by aerosols and clouds
  (11 aerosol components, 5 types of water clouds and 8 types of ice clouds)
- Treatment of heterogeneous cloud cover
  (weighted average of elemental overcast columns)
- Improved integration accuracy for optically thick layers
  (new linear in _ parameterization of the Planck function)

Over the next 6 months RTIASI will be formally merged with RTTOV and then the science will be tested using real AIRS radiance data

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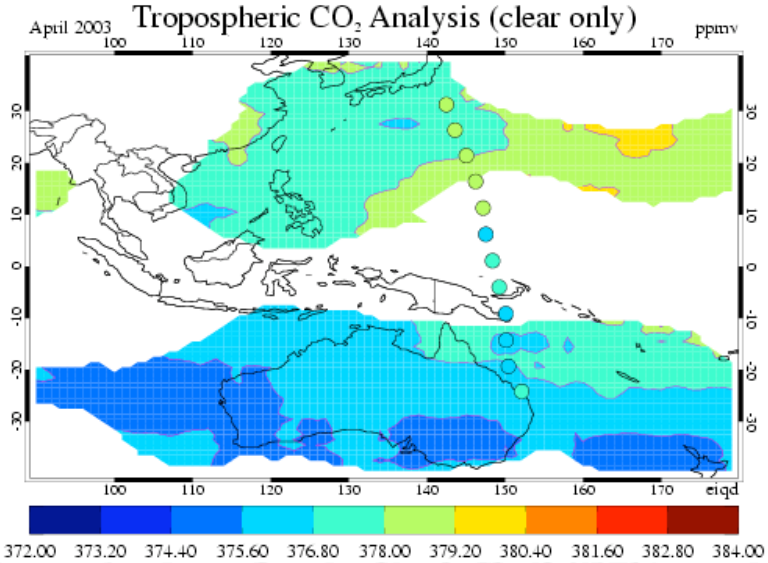
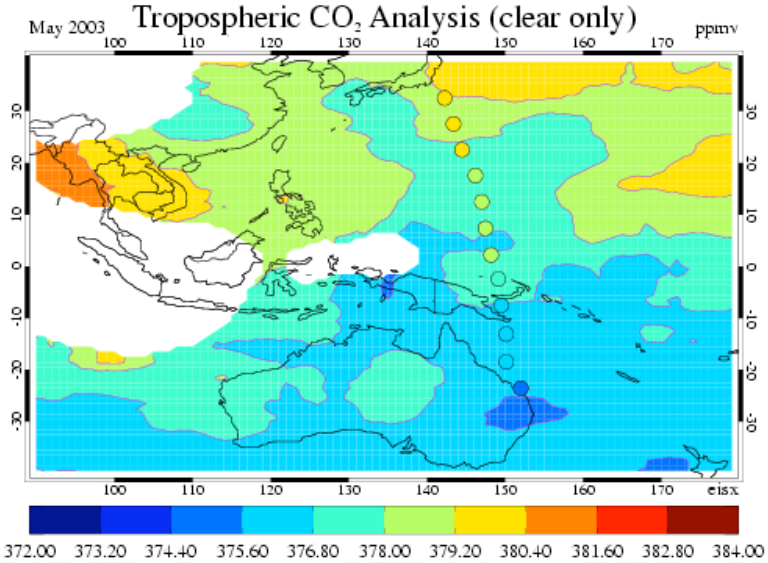
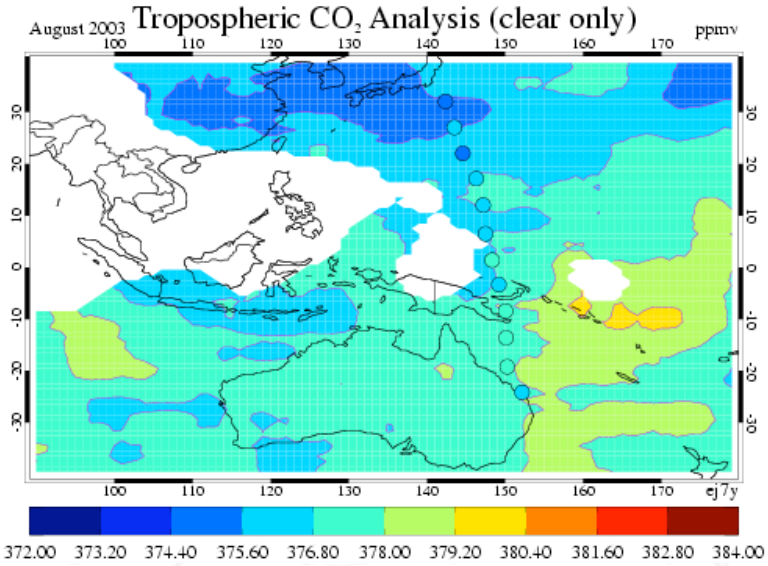
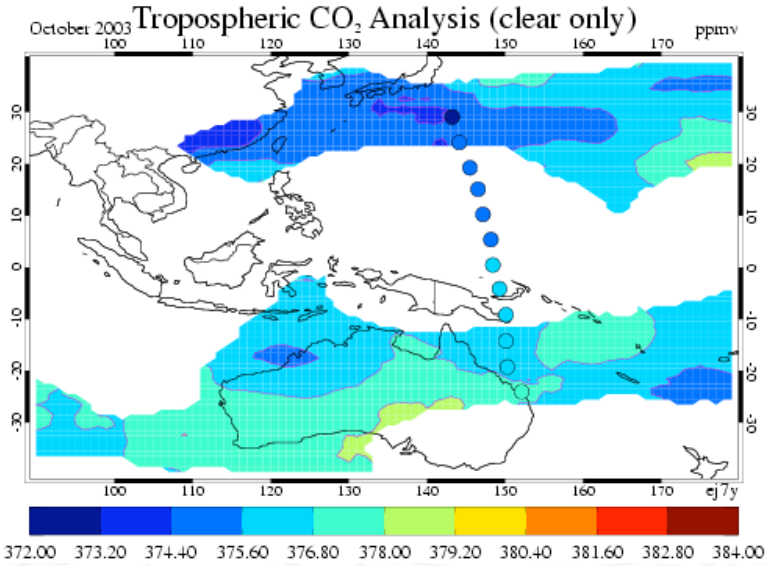
CO_2 Assimilation - Validation



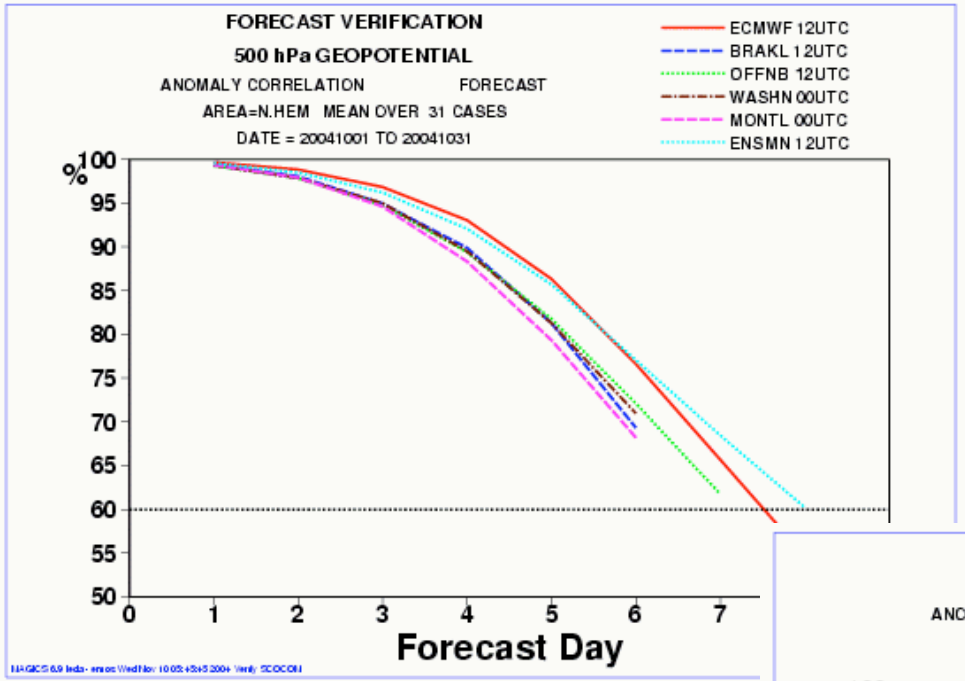






End

End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500 hPa GEOPOTENTIAL
ANOMALY CORRELATION FORECAST
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DATE = 20041001 TO 20041031
ECMWF 12UTC
BRAKL 12UTC
OFFNB 12UTC
WASHN 00UTC
MONTL 00UTC
ENSMN 12UTC
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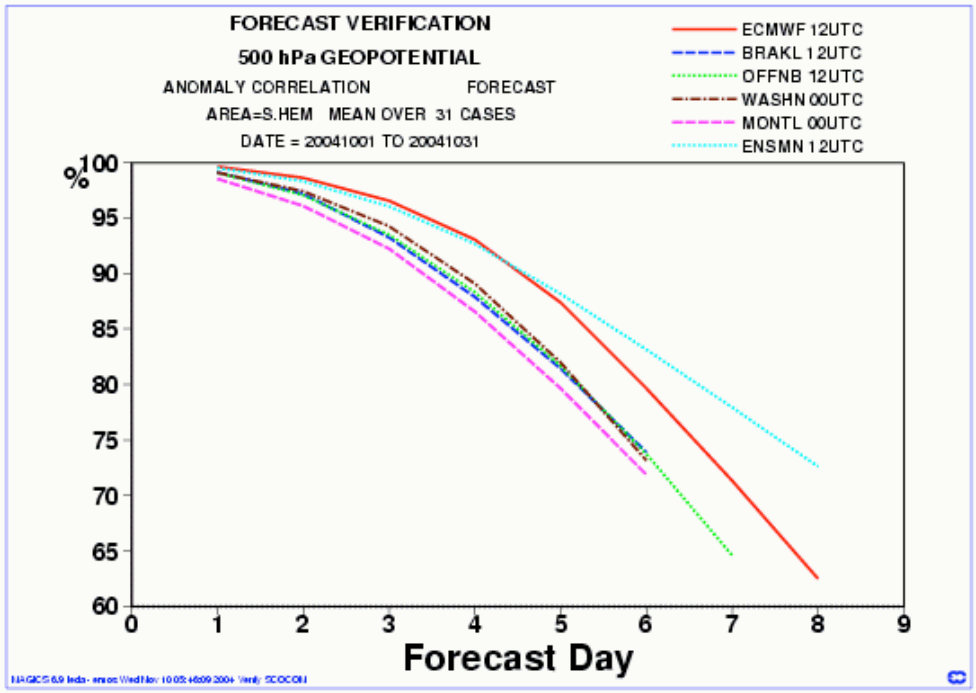
7
Forecast Day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ENSMN 12UTC
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Forecast Day